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Effrosyni Adamopoulou and Giulia M. Tanzi

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Academic Performance and the Great Recession¹

Effrosyni Adamopoulou²

Bank of Italy

Giulia Tanzi³

Bank of Italy

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Abstract. In this paper we study how the Great Recession affected university students in terms of performance, with a special focus on the dropout probability. To do so, we use individual-level data on a representative sample of university students in Italy in 2007 and 2011. We measure the severity of the recession in terms of increases in adult and youth unemployment rate and we exploit geographical variation to achieve identification. On the one hand, an increase in adult male unemployment rate deteriorates the financial condition of the family, raising the dropout probability. On the other hand, by reducing the opportunity cost of tertiary education, an increase in youth unemployment rate decreases the dropout probability. Focusing on students who were enrolled at the university before the recession we are able to study the effects of the crisis on performance net from any potential effect on enrollment. We find evidence that overall, university dropout decreased as a result of the Great Recession and that the probability of on-time graduation increased for more motivated students. The effects, however, are considerably heterogeneous across gender and other socio-economic indicators.

JEL classifications: D12, E32, J24

Keywords: academic performance, dropout, great recession, unemployment

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²Bank of Italy, Research Department, Structural Economic Analysis, Labor Market Division, Via Nazionale 91, 00184, Rome, ITALY. Email: Effrosyni.Adamopoulou@bancaditalia.it

³Bank of Italy, Regional Economic Analysis and Research Division, Milano Branch, Via Cordusio 5, 20123, Milano, ITALY. Email: giuliamartina.tanzi@bancaditalia.it.

1 Introduction

Labor market prospects and the financial situation of the family are known determinants of educational decisions (Becker, 1964). Job insecurity during the Great Recession might have changed the incentives to accumulate human capital. In the US there is evidence that the Great Recession decreased university enrollment (Long, 2013). Little is known though on how enrolled university students reacted to this shock in terms of effort and the probability to drop out. Although both the enrollment and the dropout decision are part of the decision to invest in human capital, dropping out entails one extra cost: the time and resources already invested in tertiary education. In this paper we use individual-level data on students of Italian Universities that got enrolled before the Great Recession and got hit by it in their 2nd year of university studies, in order to examine the effect of the Great Recession on academic performance. We focus on three distinct measures of performance, i.e., the dropout probability, the probability to graduate on time (i.e., in 3 years after enrollment), and the frequency of course attendance.

The reason we focus on Italy is threefold. First, the availability of nationally-representative individual-level data that allows us to compare multiple student cohorts, enables us to exploit regional variation for identification, and provides us with information on the students' field and university of study, family background and ability measures even for those who drop out. This kind of information is generally unavailable in population or labor force surveys. Second, the fact that Italy is among the European Union countries with the lowest percentage of university graduates and the highest youth unemployment rate. Third, the fact that contrary to the US, the Great Recession in its initial stage (2008-2010) was a shock that came to Italy from abroad.⁴

The university dropout rate has received a lot of attention in Italy due to its high prevalence. Since the 70's and until the early 90's it has reached values well above 60% (Cingano and Cipollone, 2007). In a related paper before the Great recession, Di Pietro (2006) finds that regional unemployment rates are negatively associated with the dropout rate. We focus our analysis to the latest cohort of students and we examine whether the Great recession had a causal effect on the probability to drop out of the university.

Our identification strategy is based on regional variation in the severity of the Great

⁴See the discussion in subsection 4.2.

Recession. Our measures of the recession are the change in the adult male unemployment rate and the change in the youth unemployment rate between 2005-2007 and 2008-2010.⁵ The first is a proxy of changes in the financial situation of the student's family while the latter is a proxy of changes in the opportunity cost of studying. We estimate a linear probability model with regional fixed effects using data on university students in Italy and we find that youth and adult unemployment rates have opposite effects on the probability to drop out of the university. The coefficient of youth unemployment rate is negative and statistically significant, suggesting that the dropout probability decreases as the opportunity cost of studying goes down. By contrast, the coefficient of adult male unemployment rate is positive and statistically significant, and is larger in size. An adverse employment shock to the family of origin increases the dropout probability due to financial constraints. Given that the unemployment rate has increased more sharply for the young during the Great Recession, the net effect is a decrease in the dropout probability especially for boys.⁶ A placebo test confirms that the estimated effects are not due to preexisting trends.

Our findings are in line with Aguiar, Hurst, and Karabarbounis (2013) who document that time spent in education by men in the US has increased during the Great Recession. Using the cross-state variation in foregone market work they find that singles in general allocate more than 10 percent of their increased time to education. Our results are also consistent with earlier papers on the countercyclicality of college enrollment in the US (Betts and McFarland, 1995; Dellas and Sakellaris, 2003). However, there is no direct correspondence between enrollment and dropout as the latter entails the sacrifice of initial resources. Our data allow us to identify the effect of the Great Recession on the probability to drop out net of any possible enrollment effect.

Recent papers shed light on the negative effects of graduating college in a recession in the US (Kahn, 2010) and Canada (Oreopoulos, von Wachter and Heisz, 2012). Both papers find negative wage effects that persist over time. Herschbein (2011) focuses on high school graduates in the US and finds that their wages were less affected by the recession than the ones of college graduates. We focus instead on the educational out-

⁵The Great Recession hit Italy in the last quarter of 2008 and had adverse effects on labor markets (See D'Amuri, 2011).

⁶This gender difference depends on the students' field of study and on the education of the mother. See Subsection 3.3 for details.

comes of university students and we find that the recession may also affect human capital accumulation through changes in the university dropout rate.

The idea that the recession affects academic performance can be viewed as part of the broad literature on credit constraints in education. Lovenheim (2011) finds that households used their housing wealth to finance postsecondary enrollment in the 2000s when housing wealth was most liquid. This finding implies that the recent housing bust could significantly affect college enrollment through the reduction in housing wealth of families with college-age children. Bound, Lovenheim, and Turner (2010) find that increases in the housing wealth of the student's family increase the probability that the student attends a university of higher quality (flagship public university instead of a non-flagship one). They also find some evidence of an increase in the likelihood of completing college for lower income students. Cameron and Taber (2004) instead do not find evidence that borrowing constraints generate inefficiencies in the market for schooling. Their identification is based on the prediction that the opportunity cost of schooling (measured by local low-skill wage rates) and the direct cost (measured by whether there is a college in the individual's county of residence) affect borrowing-constrained and unconstrained persons differently.

Credit constraints can be confused with adverse initial conditions. Carneiro and Heckman (2002) find that long-run factors crystallized in ability are the major determinants of the family income-schooling relationship, and that only 4% of the US population is credit constrained in the short-run sense. Belley and Lochner (2007) find that family income has become a much more important determinant of college attendance in the early 2000s than in the 1980s suggesting that credit constraints might be more relevant for the recent cohorts. The richness of our data allows us to control for initial conditions by providing us with information on parental education, labor market condition, and occupation when the students were 14 years old.

Credit constraints can be a reason of dropping out of university. Stinebrickner and Stinebrickner (2008) use direct information on the reasons of dropping out for students of a college in Kentucky, and examine how much college attrition would remain even if credit constraints were removed. They find that although credit constraints are likely to play an important role in the dropout decisions of some students, the large majority of

attrition of students from low income families should be primarily attributed to reasons other than credit constraints. In a more recent paper using the same data, Stinebrickner and Stinebrickner (2012) find that college dropout arises as students learn about their academic ability or grade performance after matriculation. Our database, which is representative of the entire population of university students in Italy, also contains information on the reason of dropping out, with "studies being too costly" among the possible reasons. In our data, both before and during the Great Recession, only around 5% of college dropouts report "studies being too costly" as the main reason of dropping out.

Students' college preparation as well as collegiate characteristics may also affect the dropout decision (Bound, Lovenheimer, and Turner, 2010). We use high school grade as a measure of students' ability. We also exploit official data on the ranking of Italian universities by field of study. We can thus control for the ability of the students and the quality of the university they attend.

There are also papers studying the relationship between local labour market conditions and the probability to leave post-compulsory secondary education before the Great Recession (see Petrongolo and San Segundo, 2002 for the case of Spain; Clark, 2011 for the case of the UK; Mocetti, 2012 for the case of Italy). Given the young age of high school students, the decision of dropping out might mainly reflect the will of the family rather than the one of the student. By focusing instead on university students we are more likely to capture the decision to drop out by the student itself. Moreover, secondary education in Italy is practically free of charge as most students attend tuition-free public high schools. By contrast, tertiary education is costly, as both private and public universities charge tuition fees.

The rest of the paper is organized as follows. Section 2 describes the data and presents evidence on regional differences in the severity of the recession. Section 3 introduces the empirical strategy, discusses the identification issues, and presents the main results. Section 4 includes robustness checks and the results for other outcomes. Section 5 concludes.

2 Data

Our data come from the Survey on Educational and Professional Paths of Upper Secondary School Graduates that has been conducted by the Italian National Statistical Institute (Istat).⁷ The survey covers a representative sample of high school graduates in Italy three years after high school graduation. There are 4 waves available: Survey 2001 on graduates of 1998, Survey 2004 on graduates of 2001, Survey 2007 on graduates of 2004, and Survey 2011 on graduates of 2007. The survey consists of more than 20,000 interviewed individuals in each wave and provides with detailed information on educational and labor history as well as on parental background characteristics. High school graduates at the time of the survey might study at a university, work, study and work at the same time, be unemployed, or be inactive. In the case of dropouts there are questions regarding the educational history up to the moment of dropping out as well as information on the reason of dropping out.

The last wave (Survey 2011) is the survey that took place during the recession. Our aim is to compare students' academic achievement before and after the recession. However, due to administrative reasons the last wave took place 4 years after high school graduation. This makes the comparability of the last wave with previous waves less straightforward. Exploiting the information on the exact time of dropping out, we focus on individuals that dropped out no later than their 3rd year of university studies. This ensures comparability with previous waves with respect to our key variables.

We construct our measures of the severity of the recession using data from the Italian Labor Force Surveys in the period 2005-2007 and 2008-2010 (3-year averages corresponding to the academic years of each cohort). We compute the change in the unemployment rate for adult males aged 35-74 years old by educational attainment, and for young high school graduates aged 20-24 by gender in the student's region of origin (Figures A1 and

⁷The analyses were conducted at the Istat-Italian Research Data Center (Laboratorio Adele) in compliance with confidentiality policies and procedures. The opinions expressed in this document are the sole responsibility of the authors and do not represent the official position of the Italian National Institute of Statistics.

A2).⁸ The first measure is a proxy of the current financial situation of the father.^{9,10,11} Contrary to the US, student loans in Italy are not a common practice (Brown and Sessions, 1999). In most cases parents are the ones who finance the university studies of their children. In our data less than 15% of university students combine work and study. Therefore, the employment situation of the father matters. The second measure is a proxy of the opportunity cost of studying. As Table 1 shows, in Italy student mobility is low between regions (around 20%) but much higher between provinces (around 50%). Given that the majority of students study in the region of origin we assign to them the corresponding unemployment rate. For those who study in a different region we assume that if they drop out before finishing the university, they will look for a job in the region of origin as high school graduates. In the 2011 survey, the only wave in which the region of current job is available, a mere 8% of university dropouts found a job in a region different than the region of origin.^{12,13}

In order to control for the quality of the universities we merge our database with official data on quality indicators for all the universities in Italy by field of study. The data come from Research Evaluation (Valutazione della Ricerca), a survey conducted in 2006 by the Supervising Committee for Research Evaluation (CIVR) with the collaboration of the Ministry of Education, University, and Research (MIUR). The measure of quality is an aggregate indicator that takes into account the number and the rating of offered courses, the average characteristics and the number of courses of excellence, the number of years-researchers in international mobility programs, the number of PhD and post-

⁸We focus on the age group 20-24 (instead of 19-21) in order to alleviate the concern that as university dropouts enter the labor force the youth unemployment rate becomes endogenous. Most of the dropout decisions take place in the 1st year of studies when the students are 19. Dropouts represent a very small fraction of all young people in the age group 20-24.

⁹The survey does not contain information on the current situation of the parents. The only available information on parents' education, labor and occupational status refers to 8 years before, when the respondents were 14 years old. In order to proxy the current employment situation of the father we assign to each student the adult male unemployment rate that corresponds to the educational group of his/her father in the region of origin.

¹⁰We focus on adult males since in Italy more than 50% of adult females do not work.

¹¹Our proxy does not need to capture parental layoffs. Our results go through as long as the perception of the father about the probability of layoff is affected. Narrowing the age group to 45-64 produces similar results.

¹²This percentage is around 20% for dropouts who used to study in a region different than the region of origin.

¹³In the analysis that follows our results hold even if we exclude the students that study in a different region than the region of origin.

doc researchers, as well as the amount of research funds received from various sources (Ministry of Education, European Union, etc.).

Table 1 shows the descriptive statistics for the variables of interest for 3 different cohorts. We first focus on the last 2 columns (the cohort before the Great recession and the cohort of the Great Recession). We observe that the dropout rate has slightly decreased between 2007 and 2011.¹⁴ At the same time, the percentage of students who graduate on time and of those who attend classes more than 3 times a week has increased. Both the adult male and the youth unemployment rate have risen during the recession with the rise being larger for the young. Figures A1 and A2 show that there has been variation in the severity of the recession across regions. We now move to the empirical exercise in order to examine whether the Great recession has had any effect on students' performance.

3 Empirical exercise

According to the predictions of Becker's basic model on human capital accumulation (1964), the Great Recession has two opposite effects on academic performance. On one hand, parental resources decrease as the unemployment rate of the fathers goes up. We expect this to positively affect students' performance in order to speed up graduation. On the other hand, the opportunity cost of studying decreases as the unemployment rate of the young goes up. We expect this to negatively affect performance by delaying graduation. Regarding dropouts, we expect the opposite effects. The increase in the unemployment rate of the fathers is expected to increase dropouts due to financial difficulties, while the increase in the youth unemployment rate is expected to decrease dropouts due to the scarcity of outside options. In our data 76% and 67% of university dropouts in 2007 and 2011 respectively are working, suggesting that finding a job became more difficult during the crisis.

The Great Recession might also have influenced enrollment, that would indirectly affect performance. Less competent students who before the recession would prefer to work instead of going to the university, might decide to go to the university during the

¹⁴A recently released report from the National Agency for the Evaluation of Universities and Research Institutes (ANVUR, 2014) confirms the decrease in the dropout rate.

recession due to lack of job opportunities. Likewise, more competent students who before the recession would prefer to go to the university might not be able to do so during the recession due to lower parental income. As a result a composition effect would arise, that could undermine performance. The timing of the survey enables us to study the effect of the recession on performance net from any potential effect on enrollment. The most recent wave of the survey took place in 2011, i.e., during the recession and entailed young individuals who graduated high school in 2007. The vast majority of those who got enrolled at a university did so immediately after graduation in 2007, i.e., before the recession hit Italy.¹⁵ Hence, their enrollment decision was not affected by the recession. Given that the Great Recession has not been predicted (Bezemer, 2009), we also rule out anticipation effects.

The university system in Italy went through a considerable reform in 2001. In particular, a 3-year First Level degree followed by a 2-year Second Level degree (3+2) replaced the old degree, typically of 4-year duration in most fields (Bratti, Broccolini and Staffolani, 2006). In our exercise we use only students in 3+2 programs that got inscribed at the university after the reform (the earliest cohort of students in our sample started university in 2001). Moreover, tuition fees increased during the Great Recession. According to the available data for a group of universities (Federconsumatori Surveys 2010, 2011, 2012), university tuition fees increased around 10% between 2011 and 2012 for students with family income less than 10,000 euros but remained practically unchanged in the period 2010-2011. In our sample we define as the "recession cohort" the cohort of students that got inscribed at the university in 2007 and we analyze the probability to drop out up to the year 2010. Hence, tuition-fees increases are unlikely to affect our results.

¹⁵In our analysis we consider only young individuals that got enrolled at the university immediately after high school graduation.

3.1 Specification and main results

We start with a linear probability model with regional and cohort fixed effects.¹⁶ The surveys in 2007 and 2011 refer to two different cohorts, therefore we do not observe the same individual over time. We proxy the financial situation of the student's family with the adult unemployment rate for males aged 35-74 in the student's region of origin according to the education of his/her father. We also proxy the opportunity cost of the student with the youth unemployment rate for high school graduates aged 20-24 years old by gender in the student's region of origin. We start our analysis with the dropout probability as the outcome variable.

Our benchmark specification is the linear probability model specified in (1),

$$\begin{aligned} dropout_{i,r,c} = & \beta_o + \beta_1(Adult\ male\ unemployment\ rate)_{r,c} \\ & + \beta_2(Youth\ unemployment\ rate)_{r,c} \\ & + \beta_3 X_{i,r,c} + \beta_4(cohort)_c + \beta_5(region)_r + \epsilon_{i,r,c} \end{aligned} \quad (1)$$

where i stands for the individual, r for the region, and c for the cohort. The dependent variable is discrete and takes the value 1 in case the student dropped out university and 0 otherwise. The independent variables are the adult male unemployment rate, the youth unemployment rate, time (cohort) dummies, regional dummies, and $X_{i,r,c}$ that includes individual controls, namely the gender, the school grade as a proxy of ability, a dummy for having a father with high school degree, a dummy for having a father with university degree, an indicator for coming from a disadvantaged family in order to account for initial conditions,¹⁷ a dummy for studying in a private university and a dummy for studying in a different region than the region of origin. We also include dummies for the particular university of study and for the specific field of study (e.g., engineering, political sciences, etc.). Hence, we are able to control for the level of difficulty that differs among fields and

¹⁶This is equivalent to a Difference-in-Differences approach with continuous treatment where we compare the outcomes before and after the Great Recession and across treated and untreated individuals. This approach has the advantage that individuals are not strictly assigned to treated and untreated groups with a switch-on/switch-off dummy variable. Instead, the unemployment rate is used as a variable with differing treatment intensity across regions and cohorts. See Angrist and Pischke, 2009 for more details.

¹⁷We define as students from disadvantaged families those whose father was either dead, unqualified worker (active or retiree), or unemployed, and whose mother was either dead, unqualified worker (active or retiree), unemployed, or housewife.

universities, as well as for university-specific traits (tuition fees, teaching practices, etc.).

We first estimate the model without the individual controls $X_{i,r,c}$ (Table 2, column 1). We find a positive and statistically significant effect of the adult male unemployment rate on the probability to drop out. Moreover, as expected, there is another channel at work, the one generated by the increase in the unemployment rate of the young. Indeed, we find that the youth unemployment rate has a negative and statistically significant effect on the dropout rate. These effects are robust to the inclusion of individual controls. Both coefficients decrease in magnitude but remain statistically significant (Table 2, column 2). Going through the coefficients of the individual controls (Table A1), we find that the probability to drop out is lower for girls, for more able students (proxied by the high school grade), and for those whose father has a high level of education. Moreover, the dropout probability is higher for students who come from a disadvantaged family, and it is lower for students that study away from home (in another region) or at a private university, probably because of the high initial sunk cost.¹⁸

In columns 3 and 4 of Table 2 we estimate the same regressions (without and with individual controls) substituting the regional fixed effects with fixed effects that capture, at the same time, the region, the level of education of the father and the gender of the student. As previously explained, our proxy of the intensity of the recession for the parents is the unemployment rate of the adults located in the same region, and with the same level of education as the student's father. Moreover, the unemployment rate of the young varies not only according to the region of the student but also according to his/her gender. Including more specific dummies than the regional ones allows to better disentangle the effects on dropouts that can be attributed to the crisis. Results are completely in line with those found using simple regional dummies and in the complete specification (Table 2, column 4) the coefficients of our variable of interests are even bigger than those in column 2.¹⁹

In order to see which effect dominates and be able to compute the net effect of the recession on the dropout probability we need to consider the changes in the adult

¹⁸We also repeat the analysis by including the unemployment rates one by one and the results are very similar (Table A2).

¹⁹In column 2 the specification includes among the individual controls the gender of the student and the level of education of the father, so as to take into account these covariates even when we include simple regional dummies.

male and youth unemployment rate. As shown in Table 1 the adult male and youth unemployment rate has increased in Italy by 0.99 and 2.36 percentage points between the period 2005-2007 and 2008-2010. Multiplying these numbers with the most conservative estimates from the linear probability model (Table 2, column 2) we get a decrease in the dropout rate by 0.08 percentage points. This suggests that the opportunity cost channel outweighed the one of the financial situation of the parents. Given that the dropout rate between the two cohorts fell by 0.65 percentage points, the recession explains 12.3% of this drop. Considering that in the years that followed (2011-2013) the youth unemployment rate has further increased at a fast pace, the overall fall in the dropout rate due to the recession is potentially large for this specific cohort of students.

3.2 Heterogeneous effects

The changes in the opportunity cost of studying and in the financial situation of the family that occurred during the recession may have affected students' dropout rate in a heterogeneous way. We thus perform the same analysis by different groups according to individual characteristics (such as the student's gender, ability, and family background), and university characteristics (field of study and quality of the university).

As Table 3 shows, the effects of the recession differ vastly by gender. First, the increase in the adult male unemployment rate led to an increase in the dropout rate only for girls, while the effect is not statistically different from zero for boys. Second, the increase in the youth unemployment rate led to a decrease in the dropout rate that was larger for boys than for girls. These two findings imply that the net effect of the recession was a decrease in the dropout rate for boys and an increase in the dropout rate for girls. In the next subsection we discuss possible explanations behind these gender differences.

We find that the Great Recession mainly affected less able students in terms of dropout probability (Table 4). This is not surprising given that less able students are the students at risk of dropping out. More able students instead remained unaffected.

There are also large differences according to the paternal socioeconomic status (Table 5).²⁰ For students coming from disadvantaged families we find a large and statis-

²⁰Here, instead of splitting the sample we introduce interactions as the size of the disadvantaged students' group is small.

tically significant increase in the dropout probability as adult unemployment rate goes up. Moreover, for these students the change in the opportunity cost of studying does not seem to matter. As expected, families with a more vulnerable economic situation had more difficulties in sustaining the burden of the cost of education. This is consistent with Christian (2007) that finds more procyclical enrollment among people from lower-income, lower-education households in the US.

We then consider if there exist heterogeneous effects according to university characteristics. Table 6 presents the estimates of the probability to drop out by field of study. The coefficient of adult male unemployment rate is positive for students in humanities (that include political/social sciences, law, literature, languages) but negative for students in science (math/physics, geology/biology, engineering/architecture, economics/statistics). Studying science might be considered by parents as an important investment for the future of their children and therefore dropout decreases in spite of the worsening of the financial conditions.

Lastly, we analyze the choices of students according to the quality of the university by field of study they are enrolled in. We find that the net effect of the crisis on the dropout rate is a large increase for students in universities placed below the 25th percentile in the rankings, an increase smaller in magnitude for students in medium quality universities, and it turns insignificant for students in high quality universities (Table 7).

3.3 Gender differences

The analysis so far has revealed a disparity in the effects of the Great Recession on the dropout decisions of boys and girls. In this subsection we try to shed light on these gender differences. Why do girls drop out more as adult male unemployment rises while boys remain unaffected? One possible explanation is the field of study. Girls are traditionally concentrated in humanities while boys are concentrated in science. In Table 8a we analyze the behavior of girls and boys by field of study. We find that the effect of adult male unemployment rate is positive for both genders in humanities. However, the effect is statistically significant only for girls and much larger in magnitude. It seems that parents consider studying humanities more as a "luxury" for their daughters.

Another possible explanation lies in the education of the mother. Mothers may act

as a role model for their daughters and as a result the choice to finish university or drop out might differ according to the educational attainment of the mother (See Cardoso, Fontainha, and Monfardini, 2010 for the pronounced role of the mother on children’s human capital investment in Italy). In Table 8b we investigate this possibility. Indeed the positive effect of adult male unemployment rate on the dropout probability is counterbalanced for girls whose mother has finished university. This means that an adverse financial shock to the father makes girls drop out more especially in the case that their mothers are not university graduates.

4 Robustness

4.1 Refining the measurement of the unemployment rate

In our baseline specification we exploit regional variation in a continuous way in order to achieve identification. In Italy the labour market size is often bigger than the province, and therefore it is more reasonable to proxy the employment conditions that the young face with the ones in the corresponding region. Nevertheless, we moved to provincial variation in order to proxy the opportunity cost and the financial situation of the family in a finer way.²¹ We obtained similar results (Table 9) but by disaggregating the unemployment statistics, we increased the measurement error. The labour force measures of unemployment for particular age groups, gender, and educational attainment are not representative at the provincial level and as a result our estimates are more noisy.

4.2 Endogeneity

One might worry that a recession cannot be considered as an exogenous treatment. Indeed, if the origin of the recession had been idiosyncratic and related to preexisting structural differences among regions, our results would not be causal. The Great Recession instead has started with the US subprime mortgage crisis in 2007 and was transmitted to Europe in October 2008 (Bordo, 2008). Hence, it was a shock that came to Italy from abroad, i.e., it did not stem directly from the inside. Caivano, Rodano, and Siviero (2010)

²¹We also adjusted the adult unemployment rate to include workers on redundancy payment (Cassa Integrazione) but this did not change our results.

find that 75% of the crisis that Italy experienced in the period 2008-2010 was "imported" from abroad while only 16% can be attributed to internal financial factors or lack of confidence. It is only after 2010 that structural problems started to play an important role.

Yet, how severely the different regions of Italy experience the recession might depend on the economic and social conditions of each region. For example, the South of Italy was typically characterized by high unemployment rate while the opposite was true for the North. However, as shown in Figures A1 and A2, contrary to what one would expect, the recession affected differently regions that shared similar characteristics in terms of economic development.

4.3 Common trend assumption

The Difference-in-Differences approach is based on the “common trend” assumption, i.e., that the underlying trends in the outcome variable are the same in treated and control groups. It is in general difficult to test whether this assumption is violated. In our case it is possible, since we have data on the 2004 cohort. We thus run a placebo regression using data on two cohorts before the recession (2004 and 2007 surveys) but using the unemployment rates during the recession (2005-2007 and 2008-2010). We estimate the same model as in (1) for the placebo exercise (Table 10) and we get statistically insignificant estimates, that are very small in magnitude and have the opposite coefficients than in the benchmark true regression.²² This reassures us that the estimated effects of the unemployment rate on the dropout rate are indeed due to the recession and not due to preexisting trends.

4.4 Asymmetric effects of the business cycle

Our results insofar indicate that the net effect of the recession on the dropout rate was a fall in the dropout rate. One might wonder whether during booms the opposite is true. Going back to Table 1 we observe that between the periods 2002-2004 and 2005-2007

²²In the placebo regression we do not include university and field of study dummies as this information is not available for dropouts in the 2004 survey. For the same reason we are not able to control for studying in a different region than the region of origin and for studying in a private university. We exclude these variables from the benchmark true regression to ensure comparability.

adult male and youth unemployment rate had decreased. At the same time the dropout rate had increased. We now estimate the same linear probability model for the probability to dropout as in (1) using the 2004 and 2007 surveys and the appropriate unemployment rates (Table 11). For the earliest cohort the university and the field of study is not available for dropouts so we are not able to include the corresponding dummies and the controls for private university and for studying in a different region in the estimated specifications.²³ As soon as we control for individual characteristics we do not find any statistically significant effect of the boom on the dropout rate. It seems that the effect of the business cycle on academic performance is not symmetric. One possible explanation is that the Great Recession, in contrast to the previous business-cycle fluctuations, was an unexpected shock that students did not internalize when deciding to enroll at the university.

4.5 College premium

In our analysis we proxied the opportunity cost of tertiary education using the youth unemployment rate of secondary-education graduates. However, a university student might also consider factors related to the college premium when deciding whether to drop out or not. In particular, the probability of finding a job as a university graduate might differ from the probability of finding a job as a high school graduate. Likewise, the wage that one will earn as a university graduate might be different from the wage of a high school graduate.

In order to account for the college employability premium we compute the unemployment rate of university graduates aged 25-29 by region and gender using the Labor Force Survey. We define the college employability premium as the difference between the unemployment rate of university and high school graduates. Indeed, the employability of university graduates with respect to high school graduates has been improved during the Great Recession (Table A3, upper panel).

Data on wages by education, gender, and age group at regional level are more difficult to find. The Labor Force Survey started collecting information on wages only in 2009. We use the Survey on University Graduates' Vocational Integration in 2007 and 2011 in

²³This lack of information also prevents us from pooling the data for all cohorts.

order to compute the monthly net wage of university graduates three and four years after graduation by gender and region. Similarly, we draw information on the monthly net wage of high school graduates by the Survey on Educational and Professional Paths of Upper Secondary School Graduates in 2007 and 2011.²⁴ We compute the college wage premium as the difference in the monthly net wage of university and high school graduates. It seems that the college wage premium has increased during the Great Recession (Table A3, lower panel).

We now re-estimate the model of the probability to drop out including the college employability premium (Table 12, column 1) or the college wage premium (Table 12, column 2) as an extra regressor. None of the college premium variables is statistically different from zero. By contrast, the youth unemployment rate remains statistically significant. This result implies that during the Great Recession university students did not seem to consider the college premium in their decision to drop out. In fact, the increase in the youth unemployment rate has received a lot of attention by the Italian media. This might explain its key role in shaping the dropout decisions.

4.6 Other outcomes

Apart from the effect on the dropout rate, the Great Recession may also have altered the behavior of the students that did not interrupt their studies. In particular, there might be an effect on the timing of graduation and on the frequency of class attendance, which are both measures of the effort exerted by the student. Youth and adult male unemployment rate may have opposing effects on these outcomes as well. We expect a positive effect of an increase in the adult male unemployment rate. Parents may put pressure on their child to graduate on time so as to save money in terms of university fees or to be more appealing when entering the labour market. At the same time, an increasing youth unemployment rate may make students delay graduation, as job opportunities become scarce. Similarly for the frequency of class attendance. Indeed, we find a positive effect of adult unemployment rate on the probability to graduate on time and a negative

²⁴We restrict the sample to high school graduates who never got enrolled at the university so as not to include dropouts.

effect of youth unemployment rate (Table 13).²⁵ These effects though are not statistically significant when we consider all students (Table 13, column 1). Moving to the analysis by different groups we consider those students that chose to study at a particular university because it was the most convenient in terms of distance (less motivated students) versus those that made the choice of university based on its prestige, and the quality of services it offers (more motivated students).²⁶ Adult unemployment rate has a large positive effect on more motivated students. These students try to graduate as soon as possible as their families face financial difficulties. When we perform the analysis by university quality, we find a negative effect of youth unemployment rate for students at low quality universities. Lastly, we do not find any effect of the Great Recession on the frequency of class attendance (Table 14).

5 Conclusions

This paper adds to the understanding of university dropout by examining the effect of the Great Recession in Italy. The effect of a recession on students' dropout rate is theoretically ambiguous. The decrease in the opportunity cost of studying due to the increased difficulty in finding a job may lead to a fall in the dropout rate. At the same time, the worsening of the labour market conditions for adults may translate into more adverse financial conditions for the families. This may result in an increase in the dropout rate due to lower availability of funds. In order to capture the causal effect of the recession, it is fundamental to disentangle its effect on students' dropout decisions from its effect on enrollment. In order to do this, we use unique information on a cohort of university students in Italy that got enrolled before the recession and got hit by it during their second year of studies. This makes this cohort perfectly comparable to a previous cohort that got enrolled and completed (or dropped out) studies before the occurrence of the recession. We then explore regional variation in changes in adult male

²⁵In our analysis we only consider students who are inscribed in 3+2 programs, i.e., bachelor of 3 years followed by a 2-year master. In 2011 the survey took place 4 years after university enrollment and we defined as on-time graduates those who graduated by the end of 2010. In 2007 the survey took place 3 years after enrollment but as the interviews were conducted in the end of 2007 (between november 2007 and february 2008), we have information on on-time-graduation.

²⁶See Sestito and Tonello (2011) and Rizzica (2013) on the issue of student's mobility and university choice in Italy.

and youth unemployment rate, that proxy respectively the adverse financial conditions of the student's family and the falling opportunity cost of studying. We find evidence that increases in adult unemployment rate have a positive effect on the dropout rate of university students, while increases in the youth unemployment rate have a negative effect, albeit smaller in magnitude. Since the unemployment rate of the young has increased to a greater extent than the unemployment rate of the adults, the net effect of the Great Recession is a fall in the dropout rate that can be translated into an increase in human capital accumulation. Considering that in the years 2011-2013 the youth unemployment rate has further increased, the net effect of the recession is potentially larger for this specific cohort of students.

Understanding to what extent and through which channels a crisis may affect students' choices has important policy implications. Our results suggest that human capital accumulation has increased during the first years of the Great Recession. This is of particular importance as human capital can lead to growth (Ciccone and Papaioannou, 2009), a key feature in order to exit recession. Nevertheless, one should consider any other possible side effects like over-education or the possibility that students are merely "parking" themselves at the university before drawing conclusions. Despite our finding that on-time graduation has increased for more motivated students, our data do not allow us to observe whether the students who did not drop out managed to graduate eventually. Even in the case that the number of graduates increases, it is not clear whether the Italian labor market will be able to absorb them and if so in positions that match their qualifications. Moreover, the effect of the Great Recession was not homogeneous across different socio-economic groups. Dropout increased sharply for students from disadvantaged families as a result of the recession. Policy makers should embrace scholarships towards this target group in a period of economic turbulence.

6 Tables

Table 1. Descriptive statistics of the working sample, Mean (standard error)

Survey year year of enrollment at the university	2004 2001	2007 2004	2011 2007
% dropout	11.41	13.72	13.07
% on time graduates	n.a.	14.59	18.50
% students attending class >3 times/week	90.96	89.53	93.73
% students working while studying	10.19	14.91	13.29
adult male unemployment rate (3-year average)	2.83 (2.75)	2.61 (1.94)	3.60 (2.43)
youth unemployment rate (3-year average)	24.16 (18.14)	20.05 (12.09)	22.41 (11.17)
% female	55.11	56.65	57.26
average high school grade	80.38 (12.55)	82.46 (13.00)	81.07 (12.64)
% from disadvantaged families	18.24	19.58	18.96
% with father university graduate	18.02	16.61	18.41
% with father high school graduate	42.64	45.05	46.08
% who study in a private university	n.a.	5.66	6.36
% study in a different region than the region of origin	n.a.	17.20	18.22
% study in a different province than the province of origin	n.a.	48.15	47.22
N	8,060	12,835	12,419
Notes: corrected for the survey design using the corresponding weights			
The working sample includes university students or dropouts in 3+2 programs, that got enrolled at the university immediately after high school graduation			

Table 2. Probability of university dropout, 2007-2011

	(1)	(2)	(3)	(4)
Adult male unemployment rate	0.020*** (0.002)	0.004* (0.002)	0.010* (0.005)	0.008* (0.004)
Youth unemployment rate	-0.009*** (0.001)	-0.002** (0.001)	-0.005*** (0.001)	-0.003*** (0.001)
Individual controls	No	Yes	No	Yes
Cohort dummies	Yes	Yes	Yes	Yes
Field of study dummies	Yes	Yes	Yes	Yes
University dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	No	No
Region*education*gender dummies	No	No	Yes	Yes
N	24,417	24,417	24,417	24,417
R ²	0.042	0.087	0.047	0.087

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree,
private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 3. Probability of university dropout, by gender

	(1)	(2)
	Girls	Boys
Adult male unemployment rate	0.008** (0.003)	-0.002 (0.004)
Youth unemployment rate	-0.003* (0.002)	-0.005** (0.002)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	14,658	9,759
R ²	0.071	0.103

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 4. Probability of university dropout, by ability

	(1)	(2)
	Low	High
	school grade	school grade
Adult male unemployment rate	0.008*	0.003
	(0.004)	(0.003)
Youth unemployment rate	-0.003*	-0.001
	(0.002)	(0.0009)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	9,426	14,991
R ²	0.081	0.056

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, father with university degree, father with high school degree,

private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 5. Probability of university dropout, by paternal socioeconomic status

	(1)
Adult male unemployment rate	0.002 (0.003)
Youth unemployment rate	-0.002* (0.001)
Disadvantaged father	-0.003 (0.011)
Adult male unemployment rate *disadvantaged father	0.006*** (0.002)
Youth male unemployment rate *disadvantaged father	-0.000 (0.000)
Individual controls	Yes
Cohort dummies	Yes
Field of study dummies	Yes
University dummies	Yes
Regional dummies	Yes
N	24,417
R ²	0.086

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region.

Disadvantaged father: absent, unqualified worker (active or retiree), or unemployed

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 6. Probability of university dropout, by field of study

	(1)	(2)
	Science	Humanities
Adult male unemployment rate	-0.006*	0.011**
	(0.003)	(0.005)
Youth unemployment rate	-0.003	-0.003**
	(0.002)	(0.001)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	7,641	8,992
R ²	0.121	0.089

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 7. Probability of university dropout, by quality of the university

	(1)	(2)	(3)
	University ranking	University ranking	University ranking
	<25th percentile	25th-75th percentile	>75th percentile
Adult male unemployment rate	0.014** (0.006)	0.008** (0.003)	-0.000 (0.011)
Youth unemployment rate	-0.003 (0.002)	-0.000 (0.002)	0.002 (0.003)
Individual controls	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes
Field of study dummies	Yes	Yes	Yes
University dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
N	4,567	9,962	5,469
R ²	0.130	0.089	0.091

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree,

private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 8a. Probability of university dropout, by gender and field of study

	(1)	(2)
	Girls	Boys
Adult male unemployment rate	-0.005 (0.004)	-0.002 (0.005)
Youth unemployment rate	-0.003 (0.002)	-0.009*** (0.002)
Adult male unemployment rate	0.015***	0.002
*humanities	(0.004)	(0.006)
Youth unemployment rate	-0.001	0.000
*humanities	(0.000)	(0.000)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	9,531	7,102
R ²	0.075	0.116

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 8b. Probability of university dropout, by gender and mother's education

	(1)	(2)
	Girls	Boys
Adult male unemployment rate	0.008** (0.003)	-0.001 (0.005)
Youth unemployment rate	-0.003* (0.002)	-0.005** (0.002)
Mother university graduate	-0.019 (0.017)	-0.046*** (0.022)
Adult male unemployment rate *mother university graduate	-0.005* (0.003)	-0.006 (0.009)
Youth unemployment rate *mother university graduate	0.000 (0.000)	0.001 (0.000)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	14,643	9,736
R ²	0.071	0.105

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree,

private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 9. Probability of university dropout, provincial level

	(1)	(2)
Adult male unemployment rate	0.016*** (0.002)	0.001 (0.002)
Youth unemployment rate	-0.004*** (0.0004)	-0.001* (0.001)
Individual controls	No	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Provincial dummies	Yes	Yes
N	23,558	23,549
R ²	0.046	0.095

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 10. Probability of university dropout, placebo

	(1)	(2)
	Placebo	Benchmark
Adult male unemployment rate	-0.000 (0.002)	0.005*** (0.002)
Youth unemployment rate	0.000 (0.001)	-0.002* (0.001)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	No	No
University dummies	No	No
Regional dummies	Yes	Yes
N	20,895	24,961
R ²	0.073	0.070

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 11. Probability of university dropout, 2004-2007

	(1)	(2)
Adult male unemployment rate	-0.003 (0.002)	0.001 (0.003)
Youth unemployment rate	0.000 (0.000)	-0.000 (0.000)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	No	No
University dummies	No	No
Regional dummies	Yes	No
Region*education*gender dummies	No	Yes
N	20,895	20,895
R ²	0.073	0.074

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 12. Probability of university dropout, college premium

	(1)	(2)
Adult male unemployment rate	0.004*	0.004*
	(0.002)	(0.002)
Youth unemployment rate	-0.002*	-0.002*
	(0.001)	(0.001)
College employability premium	-0.0003	
	(0.0008)	
College wage premium		0.00005
		(0.00005)
Individual controls	Yes	Yes
Cohort dummies	Yes	Yes
Field of study dummies	Yes	Yes
University dummies	Yes	Yes
Regional dummies	Yes	Yes
N	24,417	24,417
R ²	0.087	0.087

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 13. Other outcomes, probability of on-time graduation

	(1)	(2)	(3)	(4)	(5)
		Choice of university		University ranking	
	All	Low	High	Below	Above
		motivation	motivation	median	median
Adult unemployment rate	0.004 (0.003)	-0.002 (0.004)	0.008** (0.003)	0.003 (0.004)	0.006 (0.005)
Youth unemployment rate	-0.002 (0.002)	-0.000 (0.002)	-0.002 (0.002)	-0.004* (0.002)	0.000 (0.003)
Individual controls	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes
Field of study dummies	Yes	Yes	Yes	Yes	Yes
University dummies	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes
N	21,236	10,605	10,631	8,420	8,802
R ²	0.168	0.155	0.196	0.160	0.200

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree,

private university, studying in a different region, coming from a disadvantaged family.

Controlling for dropouts.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table 14. Other outcomes, frequency of attendance

	(1)
Adult male unemployment rate	0.001 (0.003)
Youth unemployment rate	0.000 (0.001)
Individual controls	Yes
Cohort dummies	Yes
Field of study dummies	Yes
University dummies	Yes
Regional dummies	Yes
N	19,485
R ²	0.041

Notes. Robust standard errors reported in parenthesis, clustered at the regional level.

Individual controls: gender, high school grade, father with university degree, father with high school degree, private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

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8 Appendix

Table A1. Probability of university dropout, Full specification

	LPM
Adult male unemployment rate	0.004* (0.002)
Youth unemployment rate	-0.002** (0.001)
Gender	-0.033*** (0.009)
High school grade	-0.005*** (0.000)
With father university graduate	-0.081*** (0.012)
With father high school graduate	-0.042*** (0.009)
Study in a different region	-0.013** (0.005)
From disadvantaged family	0.033*** (0.007)
Private university	-0.474* (0.026)
Cohort dummies	Yes
Field of study dummies	Yes
University dummies	Yes
Regional dummies	Yes
N	24,417
R ²	0.087

Notes. Robust standard errors reported in parenthesis clustered at the regional level.

Cross sectional weights used in all specifications

Significance levels: *** = 1%, ** = 5%, * = 10%.

Table A2. Probability of university dropout, 2007-2011

	(1a)	(1b)	(2a)	(2b)
Adult male unemployment rate	0.019*** (0.002)		0.004* (0.002)	
Youth unemployment rate		-0.008*** (0.001)		-0.002* (0.001)
Individual controls	No	No	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes
Field of study dummies	Yes	Yes	Yes	Yes
University dummies	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes
N	24,417	24,417	24,417	24,417
R ²	0.037	0.031	0.087	0.087

Notes. Robust standard errors reported in parenthesis, clustered at the regional level

Individual controls: gender, high school grade, father with university degree, father with high school degree,

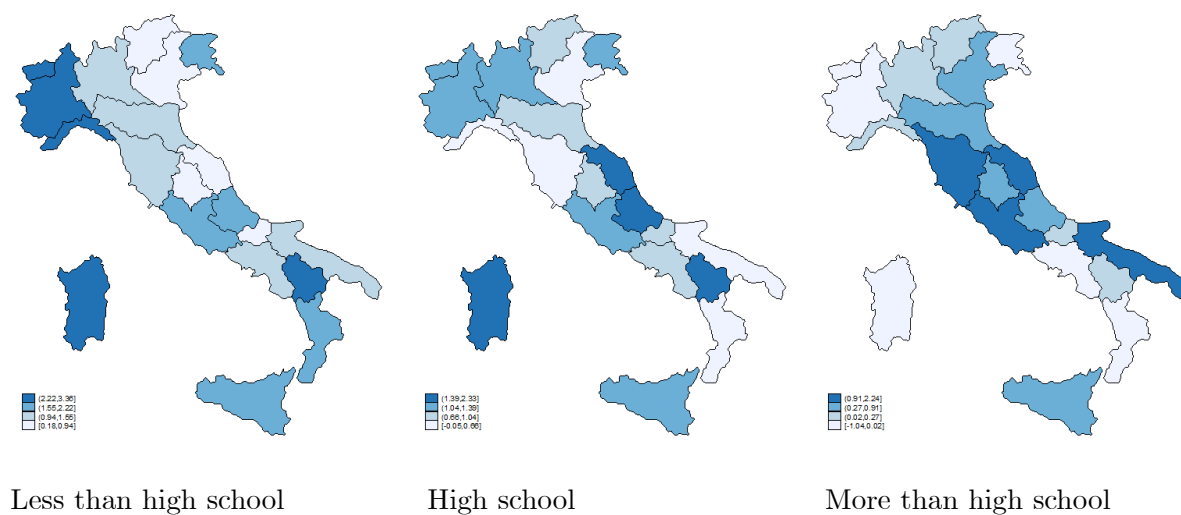
private university, studying in a different region, coming from a disadvantaged family.

Cross sectional weights used in all specifications. Significance levels: *** = 1%, ** = 5%, * = 10%.

Table A3. College premium, Mean (standard error)

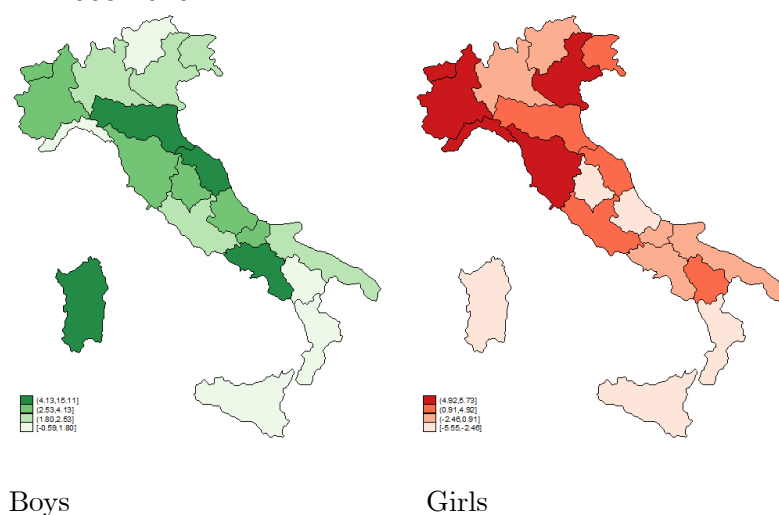
Survey year year of graduation	2007 2004	2011 2007
Employability premium		
youth unemployment rate of high school graduates (3-year average)	20.05 (12.09)	22.41 (11.17)
youth unemployment rate of university graduates (3-year average)	21.35 (11.88)	18.22 (9.91)
Wage premium		
net monthly wage of high school graduates (in euros)	982 (157)	983 (170)
net monthly wage of university graduates (in euros)	1,217 (151)	1,313 (163)
Notes: corrected for the survey design using the corresponding weights		

Figure A1. Change in adult male unemployment rate by education between 2005-2007 and 2008-2010



Note: darker shaded areas represent regions that experienced higher increases in unemployment rate

Figure A2. Change in youth unemployment rate by gender between 2005-2007 and 2008-2010



Note: darker shaded areas represent regions that experienced higher increases in unemployment rate